CLAIMS:

1. In a non-homogenous sample population having a plurality of members, each member having a plurality of characteristics including at least one continuous variable characteristic common to the plurality of members of the sample population, a method of segmenting the sample population into sub-populations having substantially unknown attributes prior to segmentation, the method comprising the steps of:

determining sub-population parameters of a plurality of sub-populations of the sample population and sub-population provisional assignments for each of the plurality of members in response to the continuous variable characteristic;

augmenting the plurality of characteristics of each of the plurality of members with the corresponding sub-population provisional assignments;

developing assignment rules for each of the plurality of sub-populations in response to the determined sub-population parameters and at least some of the augmented plurality of characteristics; and

assigning each of the plurality of members of the sample population to one of the plurality of sub-populations in response to the assignment rules.

2. The method according to claim 1 wherein the sample population is a portion of a larger general population having a multiplicity of members and said step of assigning further assigns each of the multiplicity of members of the general population in response to the assignment rules.

3. The method according to claim 1 further comprising the step of predicting a future behavior of a sub-population in response to characteristics of members assigned to the sub-population.

4. The method according to claim 3 further comprising the steps of:

predicting a future behavior of each of the plurality of sub-populations in response to characteristics the correspondingly assigned members; and

predicting a future behavior of the sample population in response to predicted future behaviors of the plurality of sub-populations.

5. The method according to claim 4 further comprising the steps of:

either adding or removing a member to or from the general population;

in response to adding the member, assigning the added member to one of the plurality of sub-populations in response to the assignment rules;

developing a revised prediction of a future behavior of the sub-population of the added or subtracted member; and

developing a revised prediction of a future behavior of the sample population in response to predicted future behaviors of the plurality of sub-populations.

6. The method according to claim 1 wherein said step of determining sub-population parameters further includes the steps of:

receiving a dataset indicative of the plurality of characteristics of the plurality of members;

using a statistical process to produce the plurality of sub-population parameters in response to the continuous variable characteristic; and

optimally selecting a plurality of sub-populations in response the dataset.

7. The method according to claim 6 wherein said step of determining develops statistically valid estimates of an optimum number of sub-populations.

8. The method according to claim 6 wherein the sub-populations have mixing proportions and said step of determining develops statistically valid estimates of mixing proportions of the sub-populations.

9. The method according to claim 6 wherein the sub-populations have parametric estimates and said step of evaluating develops statistically valid parametric estimates of each of the sub-populations.

10. The method according to claim 6 wherein the statistical process includes a Fuller Penalized Chi Square statistical process for analyzing a finite mixture population to account for a number of parameters and sub-populations derived from the population, the Fuller Penalized Chi Square statistical process represented as:

$$pX^2 = X^2 + G$$

where G = a penalty factor proportional to the # of estimated parameters

wherein Chi Square is represented as:

$$X^2 = \sum_k (O_k - E_k)^2 / E_k$$

where: O_k = Observed samples in block k, k=1 to r

E_k = Expected samples in block k, k=1 to r

r = # of blocks in the histogram

k = # of sub-populations

and the method further comprises the steps of:

evaluating a number of sub-populations estimates using the Penalized Fuller Chi Square method; and

deriving an optimal solution for the evaluated number of sub-populations.

11. The method according to claim 1 wherein the plurality of characteristics include at least a first and a second continuous variable characteristic, and said step of determining sub-population characteristics further includes the steps of:

receiving a dataset indicative of characteristics of the plurality of members;

using a statistical process to produce a first plurality of sub-population parameters in response to the first continuous variable characteristic;

optimally selecting a first plurality of sub-populations in response the first plurality of sub-population parameters;

using the statistical process to produce a second plurality of sub-population parameters in response to the second continuous variable characteristic; and

optimally selecting a second plurality of sub-populations in response the second plurality of sub-population parameters; and

optimally selecting between the first and second plurality of sub-populations.

12. The method according to claim 1 wherein said step of determining sub-population provisional assignments determines the provisional assignments by a classification process.

13. The method according to claim 1 wherein the sub-populations resulting from said step of assigning are substantially not non-homogenous, the method further including the steps of:

developing statistically valid mixing proportions and parametric estimates of each sub-population for forecasting a behavior response characteristic of each sub-population; and

developing and a statistically valid confidence interval around the forecast behavior.

14. A Fuller Penalized Chi Square method for analyzing a finite mixture of a sample population to account for a number of parameters of sub-populations derived from the sample population wherein the Fuller Penalized Chi Square method is represented as:

$$pX^2 = X^2 + G$$

where G = a penalty factor proportional to the # of estimated parameters

wherein Chi Square is represented as:

$$X^2 = \sum_k (O_k - E_k)^2 / E_k$$

where: O_k = Observed samples in block k, k=1 to r

E_k = Expected samples in block k, k=1 to r

r = # of blocks in the histogram

k = # of sub-populations

and the method comprises the steps of:

generating a number of sub-population estimate sets using the Fuller Penalized Chi Square method;

deriving an optimal solution for the generated number of sub-populations estimate sets; and

selecting one of the sub-population estimate sets in response to the optimal solution.

15. The method according to claim 14 wherein said step of deriving selects a minimal valid number while substantially avoiding issues of model overfit.

16. The method according to claim 14 wherein said step of evaluating develops statistically valid estimate of an optimum number of sub-populations.

17. The method according to claim 14 wherein the sub-populations have mixing proportions and said step of evaluating develops a statistically valid estimate of mixing proportions of the sub-populations.

18. The method according to claim 14 wherein the sub-populations have parametric estimates and said step of evaluating develops statistically valid parametric estimates of each sub-population.

19. The method according to claim 14 wherein the sample population has a plurality of members, each member having a plurality of characteristics and the method is further for segmenting the members of the sample population into a plurality of sub-populations, the method further comprising the steps of:

determining sub-population provisional assignments for each of the plurality of members and sub-population parameters for the selected sub-population estimate set of said step of selecting;

augmenting the plurality of characteristics of each of the plurality of members with the corresponding sub-population provisional assignments;

developing assignment rules for each of the plurality of sub-populations in response to the sub-population parameters and at least some of the plurality of augmented characteristics of the plurality of members; and

assigning the plurality of members of the sample population to one of the plurality of sub-populations in response to the assignment rules.

20. In a non-homogenous sample population having a plurality of members, each member having a plurality of characteristics including at least one continuous variable characteristic common to the plurality of members of the sample population, a device for segmenting the sample population into sub-populations having substantially unknown attributes prior to segmentation comprising:

an estimation processor for determining sub-population parameters of a plurality of sub-populations of the sample population and sub-population provisional assignments for each of the plurality of members in response to the continuous variable characteristic;

an *a priori* classification processor for augmenting the plurality of characteristics of each of the plurality of members with the corresponding sub-population provisional assignments; and

a posterior classification processor for developing assignment rules for each of the plurality of sub-populations in response to the determined sub-population parameters and at least some of the augmented plurality of characteristics of the plurality of members.

21. The apparatus of claim 20 further comprising

an evaluation processor for utilizing a statistical process to produce a plurality of sub-population characteristics in response to the continuous variable characteristic and for optimally selecting a plurality of sub-populations in response the plurality of sub-population characteristics wherein the statistical process includes a Fuller Penalized Chi Square statistical process for analyzing a finite mixture population to account for a number of parameters and sub-populations derived from the population, the statistical method being represented as:

$$pX^2 = X^2 + G$$

where G = a penalty factor proportional to the # of estimated parameters

wherein Chi Square is represented as:

$$X^2 = \sum_k (O_k - E_k)^2 / E_k$$

where: O_k = Observed samples in block k, k=1 to r

E_k = Expected samples in block k, k=1 to r

r = # of blocks in the histogram

k = # of sub-populations.